Applicant respectfully submits that claim 1 is unanticipated by McDeVitt et al as there is no disclosure or suggestion in the reference of forming a conductive liner in a hole of a dielectric layer, treating the conductive liner with hydrogen, and after treating the conductive liner with hydrogen, filling the hole with a conductive metal. McDeVitt teaches a conductive structure in which an aluminum/titanium/aluminum sandwich is formed. After the Al/Ti/Al sandwich is formed, it is annealed first in a hydrogen-free ambient and then in a hydrogen ambient. The Examiner argues that McDevitt teaches, at col. 7 line 4, annealing the conductive liner and at col 7 line 6, treating the conductive liner with hydrogen. While McDevitt does teach annealing a Ti layer and treating a Ti layer with hydrogen, the paragraph bridging cols. 6 and 7 clearly distinguishes this Ti layer from the conductive liner 12 of Fig. 1. Beginning at Col. 6 line 64, McDevitt states:

> The foregoing examples illustrate the two step annealing process applied to a conducting metal-titanium-conducting metal sandwich. The process is also applicable to the formation of a titanium silicide layer on a silicon surface. . . . In this case, titanium is deposited . . . on a silicon substrate and the wafer is then annealed first in a hydrogen-free atmosphere . . . followed by a second anneal in the presence of a hydrogen-containing atmosphere . . . .

This teaching by McDevitt of annealing the titanium layer is only suggested for forming a silicide on a silicon surface. There is no suggestion for performing this anneal on the conductive liner 12 before depositing the Al 14. MeDevitt teaches the two-step anneal after depositing the Al 14 and distinquishes the case for forming silicide. There is no suggestion for treating the conductive liner with hydrogen before filling the hole with a conductive metal as required by the claim. Accordingly, Applicant respectfully submits that claim 1 and the claims dependent thereon are unanticipated by McDeVitt.

The Examiner rejected claims 4, 7-8 under 35 U.S.C. § 103(a) as being unpatentable over McDeVitt et al. (U.S. 5,494,860) in view of Sharan et al. (U.S. 6,335,282).

Applicant respectfully submits that claim 1 is unanticipated by McDeVitt et al as there is no disclosure or suggestion in the reference of forming a conductive liner in a hole of a dielectric layer, treating the conductive liner with hydrogen, and after treating the conductive liner with hydrogen, filling the hole with a conductive metal. McDeVitt teaches a conductive structure in which an aluminum/titanium/aluminum sandwich is formed. After the Al/Ti/Al sandwich is formed, it is annealed first in a hydrogen-free ambient and then in a hydrogen ambient. The Examiner argues that McDevitt teaches, at col. 7 line 4, annealing the conductive liner and at col 7 line 6, treating the conductive liner with hydrogen. While McDevitt does teach annealing a Ti layer and treating a Ti layer with hydrogen, the paragraph bridging cols. 6 and 7 clearly distinguishes this Ti layer from the conductive liner 12 of Fig. 1. Beginning at Col. 6 line 64, McDevitt states:

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Applicant respectfully submits that claims 4, 7, and 8 are patentable over the references as there is no disclosure or suggestion in the references of forming a conductive liner in a hole of a dielectric layer, treating the conductive liner with hydrogen, and after treating the conductive liner with hydrogen, filling the hole with a conductive metal, as required by claim 1, from which these claims depend. As discussed above, McDeVitt does not teach treating a conductive liner formed in a hole with hydrogen prior to filling the hole with a conductive metal. Sharan is added by the Examiner to teach a plasma treatment in hydrogen that comprises ammonia. The references as combined do not disclose or suggest treating a conductive liner formed in a hole with hydrogen prior to filling the hole with a conductive metal. Accordingly, Applicant respectfully submits that claims 4, 7, and 8 are patentable over the references.

The Examiner rejected claims 9-11, 13-14 under 35 U.S.C. § 103(a) as being unpatentable over McDeVitt et al. (U.S. 5,494,860) in view of Sandhu et al. (U.S. 6,291,340).

Applicant respectfully submits that amended claim 9 is patentable over the references as there is no disclosure or suggestion in the references of depositing titanium over a dielectric layer, including on exposed surfaces within a contact hole, treating the titanium with hydrogen, and then filling the contact hole with tungsten. As discussed above, McDeVitt teaches forming an Al/Ti/Al stack and then performing a two-step anneal where the second step is a hydrogen anneal. The hydrogen anneal is performed after the Al is deposited in the via (hole). McDevitt further teaches forming a silicide on a silicon surface by applying the two-step anneal to a titanium layer deposited on silicon. The silicide process of McDevitt does not provide a suggestion for modifying the conducting metal-titanium-conducting metal sandwich process of McDevitt by performing the two-step ann al prior to depositing the Al 14. Sandhu is added by the Examiner to teach filling a hol with tungsten. There is no disclosure or suggestion in the

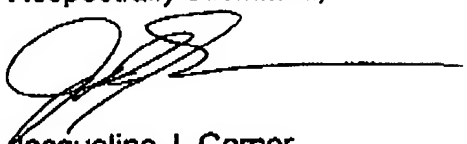
references of depositing titanium over a dielectric layer, including on expos d surfaces within a contact hole, treating the titanium with hydrogen, and then filling the contact hole with tungsten. Accordingly, Applicant respectfully submits that claim 9 and the claims dependent thereon are patentable over the references.

The Examiner rejected claims 12, 15-16 under 35 U.S.C. § 103(a) as being unpatentable over McDeVitt et al. (U.S. 5,494,860) and Sandhu et al. (U.S. 6,291,340) as applied to claim 9 and further in view of Sharan et al (U.S. 6,335,282).

Applicant respectfully submits that claims 12 and 15-16 are patentable over the references for the same reasons discussed above relative to claim 9 from which they depend. Sharan is added by the Examiner to teach a plasma treatment in hydrogen that comprises ammonia.

In light of the above, Applicant respectfully requests withdrawal of the Examiner's rejections and allowance of claims 1 and 3-16. If the Examiner has any questions or other correspondence regarding this application, Applicant requests that the Examiner contact Applicant's attorney at the below listed telephone number and address.

Respectfully submitted,



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